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The Mineral Industry of the Republic of South Africa

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of the Republic of South Africa

By George A. Morgan[1]

The Republic of South Africa was among the top world suppliers of andalusite, antimony, asbestos, chromite, coal, diamond, ferroalloys, gold, manganese ore and metal, platinum-group metals (PGM), titanium slag, uranium, vanadium, vermiculite, and zirconium in 1984. It was also a leading exporter of coal and lead concentrates, and was exceeded only by the U.S.S.R. in production of chromite, ferroalloys, manganese ore, and PGM.

The domestic processing industries, particularly the chemicals and iron and steel sectors, continued to expand consumption of locally produced mineral products and to export them in finished or semifinished forms. The mining and quarrying industry contributed 15% to the gross domestic product (GDP). About 85% by value of all mineral products sold was exported, mainly to Western industrialized countries, and mineral exports were about 67% of total exports by value. The value of major mineral commodities exported was $11.2 billion[2] and local sales were $2.44 billion, both representing declines from that of 1983. However, in terms of local currency, exports of all minerals rose by 17% and resulted in record sales by the industry, as well as a real growth in the GDP of over 4%. Gold was the single most important product on a value basis, making up 61% of total mineral earnings and 72% of total mineral export revenues. Expenditures in 1984 for capital projects and equipment for the mining industry were about $4.2 billion.

The private sector accounted for most of the mining activity in the country and consisted primarily of six multinational mining corporations: Anglovaal Ltd. (AVL), Anglo American Corp. of South Africa Ltd. (AAC), Barlow Rand Ltd. (BRL), General Mining Union Corp. Ltd. (Gencor), Gold Fields of South Africa Ltd. (GFSA), and Johannesburg Consolidated Investment Co. Ltd. (JCI). The Chamber of Mines (CM) of the Republic of South Africa acted as coordinating body for its members, of whom the multinational corporations were the most important. The CM also had responsibility for basic and applied research, for the hiring and training of mine labor, workers' compensation and wage and labor code negotiations, processing and marketing of uranium concentrate, gold and silver refining, and the marketing of Krugerands. The Council for Mineral Technology (Mintek) was responsible for metallurgical research, and the Minerals Bureau, within the Department of Mineral and Energy Affairs, collected, interpreted, and disseminated data on the mining industry for Government and public use.

Nearly 734,000 people were employed in all mines in 1984 compared with 715,000 in 1983. Gold mines accounted for 510,000 employees, and coal mines, 117,000, while the remainder were employed at all other mines. The foreign worker labor force component of total gold mine employment was over 183,000, with Lesotho, Mozambique, Botswana, and Malawi being the principal countries of origin. Approximately 12,000 coal miners were foreign nationals; the majority were from Lesotho.

PRODUCTION AND TRADE

The index of physical volume of all mining production increased to 102.9 in 1984 from 99.5 in 1983 (1980=100). For the same time periods, the index for gold was 101.2 and 100.3; iron ore, 92.4 and 62.3; copper, 100.6 and 102.5; manganese, 55.8 and 52.9; other metallic minerals, 95.4 and 88.7; diamond, 98.5 and 99.3; coal, 136.7 and 118.5; asbestos 57.6 and 78.0; and other nonmetallic minerals, 80.7 and 82.9.

Improved worldwide demand for iron and steel products accounted for production increases of major ferrous metals ores and concentrates. Most output was exported, but local sales to domestic users were also up. Ferrochromium production was near full capacity of 900,000 tons. The Republic of South Africa was the leading producer of manganese metal, which may be substituted for ferromanganese in the production of special nonferrous alloys, and stainless and carbon steels.

Increases in production capacity were under way for coal, platinum-group metals, titanium, and vanadium. Feasibility studies continued for exploitation of natural gas discovered 100 kilometers offshore Mossel Bay. Expansion of coal production facilities was expected to lead to exports of about 42 million tons of primarily steam coal, mainly through the port of Richards Bay, in 1985 and 1986.

Mineral trade data, as published by the Minerals Bureau, report local sales and exports in terms of quantity and value for most mineral commodities. Official trade data published by the Commissioner for Customs and Excise includes trade data published for the common customs area, which consists of Botswana, Lesotho, the Republic of South Africa, and Swaziland. Import data from the latter include quantity, value, and source country, but export data are not available, and are compiled by the Bureau of Mines and reported as apparent exports.

Of total mineral exports by the Republic of South Africa, valued at $13.2 billion in 1984, the United States was the recipient of $2.1 billion, which was 80% of all imports from the Republic of South Africa. These consisted primarily of chromite, diamond, ferroalloys, gold, manganese, PGM, and uranium.

The Government-owned South African Transport Services (SATS) employed 241,000 people and was responsible for airline, harbor, railroad, and road traffic in the Republic of South Africa. In 1984, total rail traffic for all commodities was 157.2 million tons compared with 158.3 million tons in 1983. Major mineral products moved by rail were base metals and iron and steel, 9.2 million tons; cement, 5.2 million tons; coal and coke, 56.6 million tons; iron ore, 18 million tons; and other mineral products, 21.4 million tons. Total cargo shipped and transshipped from seven major ports was 62.9 million tons, and total cargo landed was 14.3 million tons. Cargo cleared for shipment to Malawi, Zaire, Zambia, and Zimbabwe was 1.6 million tons, and cargo from those countries was 1.5 million tons. SATS percentage of total exports by those countries was Malawi, 50%; Zaire, 45%; Zambia, 40%; and Zimbabwe, 65%. An even larger percentage as imports to those countries passed through the Republic of South Africa. About 6,000 railroad freight cars belonging to SATS were in service in neighboring countries.

Table 1.—Republic of South Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983[p]	1984[e]
METALS					
Aluminum metal	[r]85,700	[r]83,700	105,500	161,300	167,357
Antimony concentrate:					
Gross weight	22,372	16,599	15,314	10,670	12,924
Metal content	13,067	9,810	9,127	6,310	7,440
Beryl concentrate (11% to 12% BeO)	[2]	122	58	21	1
Chromite, gross weight:					
More than 48% Cr_2O_3 thousand tons	20	36	33	25	53
44% to 48% Cr_2O_3 do.	1,989	1,561	1,193	1,070	1,242
Less than 44% Cr_2O_3 do.	1,405	1,273	939	1,129	1,711
Total[3] do.	3,414	2,870	2,164	2,224	3,006

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983[p]	1984[e]
METALS —Continued					
Columbium-tantalum concentrate ... kilograms	1,912	3,615	9,960	406	317
Copper:					
Mine output, metal content	200,683	r199,424	188,709	204,984	198,179
Metal:					
Smelter	r185,800	r185,400	191,800	192,300	167,100
Refined	140,887	144,100	142,800	157,700	155,722
Gold, primary ... thousand troy ounces	21,669	21,121	21,355	21,847	21,907
Iron and steel:					
Ore and concentrate:					
Gross weight ... thousand tons	26,312	28,319	24,554	16,605	24,496
Iron content ... do	16,840	18,124	15,714	10,627	15,677
Metal:					
Pig iron ... do	7,515	7,365	6,762	4,998	5,255
Ferroalloys, blast furnace and electric furnace:[e]					
Ferrochromium ... do	r680	r560	r438	r720	886
Ferromanganese ... do	520	450	440	r143	196
Ferrosilicochrome ... do	38	20	20	18	27
Ferrosilicomanganese ... do	70	50	40	r143	196
Ferrosilicon ... do	162	110	100	100	110
Ferrovanadium ... do	(2)	(2)	(2)	(2)	(2)
Silicon metal ... do	30	30	30	22	25
Total ... do	r1,500	r1,220	r1,068	r1,146	1,440
Steel, crude ... do	9,068	9,004	8,271	7,190	7,827
Semimanufactures:					
For immediate sale ... do	207	93	NA	NA	NA
Hot-rolled products ... do	6,568	6,707	NA	NA	NA
Iron castings ... do	2,236	2,092	NA	286	322
Steel castings and forgings ... do	72	76	NA	112	111
Total ... do	9,083	8,968	NA	NA	NA
Lead:					
Mine output, metal content	86,059	98,901	90,288	87,533	94,764
Smelter, secondary	35,400	26,900	30,400	23,600	21,900
Manganese ore and concentrate, gross weight:					
Metallurgical:					
Over 48% Mn ... thousand tons	290	368	442	674	753
45% to 48% Mn ... do	942	1,226	1,423	268	448
40% to 45% Mn ... do	997	676	713	415	432
30% to 40% Mn ... do	3,099	2,429	2,301	1,270	1,225
Total ... do	5,328	4,699	4,879	2,627	2,858
Chemical:					
Over 65% MnO_2 ... do	(2)	(2)	(2)	(2)	(2)
35% to 65% MnO_2 ... do	166	45	39	98	123
Less than 35% MnO_2 ... do	201	296	295	161	69
Total ... do	367	341	334	259	192
Total manganese[3] ... do	5,695	5,040	5,213	2,886	3,049
Metal[e]	30,000	28,000	28,000	23,400	25,000
Nickel:					
Mine output, metal content	25,700	26,400	r e22,000	20,500	25,000
Metal, electrolytic	r18,098	17,960	14,425	17,000	18,000
Platinum-group metals, metal content of concentrate, matte, refinery products[e 4] thousand troy ounces	3,100	3,110	2,600	2,600	3,500
Silver:					
Mine output, metal content ... do	7,144	7,568	6,943	6,513	6,997
Primary ... do	3,125	3,050	3,080	r e1,950	2,000
Tin:					
Concentrate:					
Gross weight[e]	6,160	6,950	7,500	6,700	5,900
Metal content	2,913	2,811	3,035	2,668	2,301
Metal, primary[5]	1,100	2,602	2,884	2,685	1,592
Titanium:					
Rutile concentrate[e]	48,000	49,900	47,000	r56,000	56,000
Slag	344,000	370,000	381,000	420,000	420,000
Uranium oxide (U_3O_8)	7,295	7,235	6,833	7,128	6,762

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983[p]	1984[e]
METALS —Continued					
Vanadium:					
Vanadiferous slag, gross weight	59,435	59,459	57,395	35,825	45,911
V content:					
Of vanadiferous slag[e]	r8,400	r8,400	r8,100	r5,100	6,500
Of V_2O_5 and vanadate products[e]	r6,503	r4,217	r3,613	r3,733	6,017
Total	r14,903	r12,617	r11,713	r8,833	12,517
Zinc:					
Concentrate:					
Gross weight	158,137	174,377	e183,000	e200,000	200,000
Metal content	79,068	87,172	91,516	109,981	106,107
Metal, smelter	81,400	r80,900	79,700	84,384	88,406
Zirconium concentrate (baddeleyite and zircon)	e80,000	e100,000	e125,000	162,281	153,123
NONMETALS					
Asbestos:					
Amosite	51,646	56,834	43,457	40,656	33,237
Chrysotile	106,940	76,772	81,140	93,061	75,414
Crocidolite	118,148	102,337	87,263	87,439	58,738
Total	276,734	235,943	211,860	221,156	167,389
Barite	2,635	2,247	3,177	6,683	4,467
Cement, hydraulic thousand tons	7,200	8,095	8,010	7,899	8,188
Clays:					
Attapulgite	3,684	5,221	4,398	4,425	4,843
Bentonite	49,815	44,372	30,827	39,529	41,849
Fire clay	154,967	282,645	259,767	117,807	162,665
Flint clay	190,488	171,500	163,075	69,984	93,755
Fuller's earth	720	434	311	312	
Kaolin	107,500	155,003	127,891	129,605	135,281
Montmorillonite	1,115	354			
Corundum, natural	141	91	62	49	21
Diamond:					
Gem[e] thousand carats	r2,812	3,429	3,342	r4,554	4,516
Industrial[e] do.	r5,708	6,097	5,812	r5,757	5,603
Total do.	8,520	9,526	9,154	10,311	10,119
Diatomite	584	615	596	1,088	258
Feldspar	52,247	57,052	47,854	45,114	39,018
Fluorspar:					
Acid-grade	e448,783	451,614	293,821	232,750	289,294
Ceramic-grade	e9,823	6,118	9,628	6,406	4,502
Metallurgical-grade	e64,112	38,789	27,386	28,446	25,410
Total	522,718	496,521	330,835	267,602	319,206
Gem stones, semiprecious:					
Emerald crystals kilograms	432	502	e547	575	440
Tiger's-eye do.	163,157	220,034	e112,000	120,000	89,030
Gypsum, crude	452,490	554,827	534,991	518,353	535,286
Kyanite-related materials:					
Andalusite	196,516	181,272	155,723	116,576	143,305
Sillimanite	16,194	15,504	10,060	815	1,311
Lime[3] thousand tons	2,184	2,251	2,150	1,892	2,110
Magnesite, crude	59,975	56,557	31,927	22,560	33,059
Mica:					
Sheet kilograms	252		NA	NA	
Waste	5,046	2,395	1,762	2,672	4,478
Nitrogen: N content of ammonia thousand tons	549	552	571	575	580
Phosphate rock, gross weight do.	3,185	2,617	2,815	2,887	2,496
Pigments, mineral, natural:					
Ochers	710	742	1,812	1,319	746
Oxides	660	555	324	369	245
Total	1,370	1,297	2,136	1,688	991
Pyrites, gross weight	1,450,000	1,475,000	e1,500,000	e1,500,000	464,878
Quartz, quartzite, glass sand (silica) thousand tons	1,629	1,387	1,260	1,184	1,471
Salt	567,270	539,801	586,210	744,295	604,785
Silcrete	5,430	9,243	5,582	1,839	1,153

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983[p]	1984[e]
NONMETALS —Continued					
Stone, n.e.s.:					
Dimension:					
Granite:[5]					
Sawn slabs	28,910	23,535	12,595	11,000	13,345
Rough blocks	181,250	182,770	160,000	150,000	196,237
Marble	5,965	6,327	6,725	4,936	NA
Crushed and broken:					
Limestone thousand tons	19,869	21,107	22,379	19,874	21,084
Shale do.	604	600	482	454	533
Sulfur:					
S content of pyrites do.	493	[r]502	465	474	634
Byproduct:					
Of metallurgy[6] do.	100	100	[r]135	125	
Of petroleum[6] do.	25	27	[r]25	32	30
Total do.	618	[r]629	625	631	664
Sulfuric acid, gross weight[6] do.	3,616	3,677	3,195	3,201	NA
Talc and related materials:					
Talc	9,466	9,464	9,743	7,617	9,793
Pyrophyllite (wonderstone)	4,900	5,662	4,070	3,575	3,851
Vermiculite	185,699	190,601	182,641	153,034	173,759
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	45,000	45,000	NA	NA	NA
Coal:					
Anthracite thousand tons	3,895	4,017	3,526	2,227	3,864
Bituminous do.	111,225	[r]126,361	140,650	142,896	158,170
Total[3] do.	115,120	[r]130,379	144,176	145,123	162,034
Coke, all types do.	5,680	5,685	NA	NA	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	31,390	33,215	35,770		
Jet fuel do.	2,920	2,920	3,285		
Kerosine do.	3,285	3,650	3,650		
Distillate fuel oil do.	34,310	35,405	37,230	NA	NA
Residual fuel oil do.	23,360	24,090	28,470		
Lubricants do.	2,555	2,555	2,555		
Other do.	6,205	8,395	11,315		
Refinery fuel and losses do.	4,015	5,475	6,205		
Total do.	108,040	115,705	128,480	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 31, 1985.

[2]Less than 1/2 unit.

[3]Data may not add to totals shown because of independent rounding.

[4]Includes osmiridium from gold ores estimated at 2,500 troy ounces per year.

[5]Domestic sales plus exports.

[6]Sulfuric acid was produced from gases derived from local smelting operations and from burning imported elemental sulfur. Sulfur imports to the Republic of South Africa, in thousand metric tons, were as follows: 1980—936; 1981—552; 1982—590; 1983—600; and 1984—not available.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	66,861	66,787	Sweden 74.
Ash and residue containing aluminum	--	213	--	All to West Germany.
Metal including alloys:				
Scrap	354	3,085	--	Japan 2,816; Taiwan 178.
Unwrought	11,221	89,251	10,597	Japan 38,540; Taiwan 36,641; Hong Kong 2,924.
Semimanufactures	3	2,020	--	Japan 1,738; United Kingdom 181; Hong Kong 47.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS —Continued				
Antimony:				
Ore and concentrate	1,135	3,767	767	France 2,463; Japan 507.
Oxides	2,903	3,461	3,461	
Metal including alloys, all forms	--	218	--	All to Belgium-Luxembourg.
Arsenic: Oxides and acids	--	17	17	
Beryllium: Ore and concentrate	205	116	116	
Chromium:				
Ore and concentrate thousand tons	852	[3]803	131	Japan 302; Netherlands 135; Austria 31.
Oxides and hydroxides	--	911	911	
Cobalt: Metal including alloys, all forms	741	31	--	United Kingdom 17; West Germany 14.
Columbium and tantalum: Ore and concentrate kilograms	[3]1,204	4	4	
Copper:				
Ore and concentrate	73,115	41,733	33	Japan 28,930; West Germany 11,867.
Matte and speiss including cement copper	222	553	--	Greece 431; West Germany 122.
Ash and residue containing copper	539	167	--	All to West Germany.
Metal including alloys:				
Scrap	9,720	10,228	233	West Germany 4,650; Belgium-Luxembourg 2,572; United Kingdom 2,106.
Unwrought	139,588	175,394	13,726	West Germany 66,941; Belgium-Luxembourg 42,873; Japan 18,599.
Semimanufactures	2,064	2,987	1,404	United Kingdom 432; Taiwan 400; Hong Kong 311.
Gold:				
Waste and sweepings troy ounces	744	7,201	6,204	West Germany 997.
Metal including alloys, unwrought and partly wrought thousand troy ounces	630	[3]2,405	28	Italy 2,137; West Germany 136; Japan 67.
Iron and steel:				
Iron ore and concentrate:				
Including roasted pyrite	5,917	--		
Excluding roasted pyrite thousand tons	11,316	8,380	--	Japan 5,143; West Germany 2,329; United Kingdom 105.
Metal:				
Scrap	3,549	46,326	--	Japan 38,463; West Germany 4,543; Taiwan 2,741.
Pig iron, cast iron, related materials	70,386	56,725	8,754	Japan 17,801; West Germany 11,731; Austria 3,390.
Ferroalloys:				
Ferrochromium	340,516	[3]741,824	129,319	Japan 193,956; West Germany 178,457; France 56,158.
Ferromanganese	298,993	[3]304,100	79,527	United Kingdom 67,119; Italy 14,417; West Germany 4,085.
Ferrosilicomanganese	72,360		47,351	Japan 24,103; West Germany 6,661; Italy 3,064.
Ferronickel	16	20	6	West Germany 14.
Ferrosilicochromium	1,668	2,434	--	Japan 2,301; West Germany 112.
Ferrosilicon	17,480	[3]22,000	--	Japan 10,399; Hong Kong 191.
Silicon metal	17,756	[3]27,000	1	Japan 12,115; United Kingdom 6,135; West Germany 4,903.
Unspecified	78,967	211,970	--	West Germany 185,244; Sweden 16,435; Italy 2,027.
Steel, primary forms	197,787	234,734	--	Turkey 72,087; Taiwan 46,414; Japan 30,934.
Semimanufactures:				
Bars, rods, angles, shapes, sections	327,227	400,547	229,359	Hong Kong 61,288; West Germany 27,861; Sri Lanka 25,509.
Universals, plates, sheets	421,780	523,720	342,676	Taiwan 55,474; West Germany 45,772; Hong Kong 20,987.
Hoop and strip	1,923	4,918	--	West Germany 4,399; Taiwan 342; Greece 99.
Rails and accessories	205	10,141	--	Turkey 9,931; Taiwan 200.
Wire	7,281	14,707	8,073	Sri Lanka 3,185; Honduras 1,334; Portugal 751.
Tubes, pipes, fittings	75,157	52,441	31,574	Hong Kong 13,530; United Kingdom 4,884.
Castings and forgings, rough	57	30	--	Japan 21; Hong Kong 5.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	47,574	110,565	--	France 48,497; West Germany 34,177; Japan 27,891.
Oxides	9	20	--	Italy 14; West Germany 4; Belgium-Luxembourg 2.
Metal including alloys:				
Scrap	151	685	--	Denmark 563; Italy 53; Japan 51.
Unwrought	10,840	13,259	--	Italy 11,469; France 993; Taiwan 507.
Semimanufactures	56	114	--	All to Hong Kong.
Magnesium: Metal including alloys:				
Scrap	30	80	9	Brazil 71.
Unwrought	57	52	--	All to Japan.
Semimanufactures	4	--		
Unspecified	--	14	--	All to Taiwan.
Manganese:				
Ore and concentrate:				
Battery-grade	18	--		
Metallurgical-grade thousand tons	2,170	[2]1,996	23	Japan 874; Netherlands 291; Italy 218.
Oxides	531	303	18	Hong Kong 105; Portugal 87; Finland 36.
Metal including alloys, all forms	9,582	14,107	4,705	West Germany 2,532; United Kingdom 2,152; Canada 2,051.
Nickel:				
Matte and speiss	10,065	74,321	--	Belgium-Luxembourg 69,820; Norway 4,424.
Ash and residue containing nickel	5,608	--		
Metal including alloys:				
Scrap	151	99	--	West Germany 49; Austria 26; Switzerland 24.
Unwrought	12,031	15,287	4,481	West Germany 2,800; United Kingdom 1,805; France 1,762.
Semimanufactures	638	150	--	France 114; Brazil 20; Italy 13.
Platinum-group metals:				
Ore and concentrate value, thousands	$22	--		
Waste and sweepings do	$3,158	$1,726	$1,568	West Germany $158.
Metal including alloys, unwrought and partly wrought:				
Palladium troy ounces	675,425	415,671	404,391	West Germany 6,366.
Platinum do	1,177,386	1,500,061	617,000	Japan 833,040; West Germany 38.
Rhodium do	51,190	84,010	84,010	
Iridium, osmium, ruthenium do	34,586	97,739	97,739	
Unspecified value, thousands	$159,845	$81,614	$3,313	Switzerland $40,472; West Germany $23,572; France $8,294.
Silver:				
Ore and concentrate[4] do	$111	$1,645	$1,630	Switzerland $14.
Waste and sweepings do	$317	$664	--	West Germany $628; United Kingdom $36.
Metal including alloys, unwrought and partly wrought do	$21,710	$2,659	--	West Germany $2,349; United Kingdom $310.
Tin:				
Ore and concentrate	1,747	212	--	All to Netherlands.
Oxides	144	270	270	
Ash and residue containing tin	244	197	--	All to West Germany.
Metal including alloys:				
Scrap	NA	4,787	--	All to United Kingdom.
Unwrought	1,136	1,333	18	United Kingdom 719; Italy 469; France 74.
Semimanufactures	1	1	1	
Titanium:				
Ore and concentrate	42,642	44,008	9,813	France 24,098; Netherlands 5,420.
Metal including alloys, semimanufactures	--	26	--	All to United Kingdom.
Uranium and thorium:				
Oxides and other compounds	3,451	3,685	3,685	
Metal including alloys, all forms, uranium	--	1,872	--	All to France.
Vanadium:				
Oxides and hydroxides	4,469	2,090	136	Japan 1,771; France 161.
Ash and residue containing vanadium	--	2,156	--	All to Belgium-Luxembourg.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	69,567	33,687	--	West Germany 19,571; Japan 12,701.
Oxides	--	41	--	Portugal 36; Sri Lanka 5.
Matte	101	--		
Ash and residue containing zinc	126	--		
Metal including alloys:				
Scrap	17	175	--	All to Taiwan.
Unwrought	648	2,231	1,000	Taiwan 699; Japan 351; Hong Kong 150.
Semimanufactures	24	44	44	
Zirconium: Ore and concentrate	72,934	[3]132,765	6,399	West Germany 26,683; United Kingdom 14,434; Netherlands 11,364.
Other:				
Ores and concentrates	73,761	78,145	--	Italy 32,289; West Germany 30,980; Belgium-Luxembourg 6,588.
Oxides and hydroxides	701	50	--	Belgium-Luxembourg 34; West Germany 16.
Ashes and residues	120,835	125,865	105	Italy 63,006; Japan 47,576; Austria 10,616.
Base metals including alloys, all forms	46,709	9,270	683	West Germany 2,546; Japan 2,528; Brazil 879.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	86	18	1	Sweden 17.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$549	$51	$3	France $47.
Grinding and polishing wheels and stones	627	1	--	All to West Germany.
Asbestos, crude	120,934	[3]183,946	11,754	Japan 56,598; Thailand 14,706; Taiwan 9,850.
Cement	87,564	47	47	
Clays, crude:				
Bentonite[2]	995	380	--	Taiwan 125.
Chamotte earth	11,428	6,014	--	West Germany 3,914; United Kingdom 2,004.
Fire clay	5,848	4,353	--	All to West Germany.
Kaolin	[3]1,387	1,493	--	All to United Kingdom.
Unspecified	31,376	57,711	--	West Germany 26,685; Italy 11,388; Japan 8,203.
Diamond:				
Gem, not set or strung value, thousands	$392,203	$405,726	$316,973	Belgium-Luxembourg $42,958; Hong Kong $24,679; Japan $7,286.
Industrial stones do	$45,649	$52,594	$39,000	Japan $6,670; West Germany $4,945.
Dust and powder do	--	$3,393	--	France $3,383; Japan $10.
Diatomite and other infusorial earth do	$33	--		
Feldspar, fluorspar, related materials:				
Feldspar	[3]1,389	--		
Fluorspar	279,758	[3]246,462	--	Japan 72,086.
Unspecified	1,036	168,900	102,744	West Germany 38,750; Italy 26,388.
Fertilizer materials:				
Crude, n.e.s	--	2,902	--	West Germany 2,096; France 522.
Manufactured:				
Ammonia	2	--		
Nitrogenous	366	140	--	All to Sri Lanka.
Phosphatic	10,263	11,389	--	West Germany 9,320; Belgium-Luxembourg 2,069.
Unspecified and mixed	55	24	--	Netherlands 15; United Kingdom 5; West Germany 4.
Graphite, natural	437	380	380	
Gypsum and plaster[2]	2,769	3,003	--	NA.
Kyanite and related materials:				
Andalusite[2]	76,714	69,264	--	NA.
Sillimanite[2]	6,309	2,560	--	NA.
Lime	[3]59,840	--		
Magnesite	201	1,108	1,108	
Mica: Crude including splittings and waste	1,212	[3]392	--	Japan 221; West Germany 128; Italy 43.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
NONMETALS —Continued				
Phosphates, crude	124,734	258,909	60	Denmark 95,796; West Germany 61,267; Norway 35,965.
Phosphorus, elemental	276	712	106	Taiwan 606.
Pigments, mineral:				
Natural, crude[2]	363	200	--	NA.
Iron oxides and hydroxides, processed	56	2	--	All to Netherlands.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$6,061	$961,056	$1,224	Hong Kong $957,550; Switzerland $827; West Germany $788.
Synthetic do.	$3	$6,204	--	Turkey $6,172; Sweden $24.
Pyrite, unroasted	--	[3]103,662	--	NA.
Salt and brine	[3]67,197	--		
Sodium compounds, n.e.s.: Sulfate, manufactured	--	348	--	Hong Kong 288; Taiwan 60.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	155	244	2	France 63; Italy 58; Japan 48.
Worked do.	1,763	[5]1,597	NA	United Kingdom 927; Netherlands 458; Portugal 80.
Gravel and crushed rock	12,227	--		
Limestone other than dimension[2]	54,940	61,381	--	NA.
Quartz and quartzite	29,287	779	20	Netherlands 423; West Germany 227.
Sand other than metal-bearing	7,548	4,558	--	Belgium-Luxembourg 3,842; Ireland 370; Hong Kong 38.
Sand and gravel	--	2	2	
Sulfur:				
Elemental[2]	31,867	11,338	--	NA.
Sulfuric acid	90	--		
Talc, steatite, soapstone, pyrophyllite	44	94	NA	West Germany 78; Sweden 9.
Vermiculite[2]	146,094	113,154	--	United Kingdom 26,968; France 15,779; West Germany 7,956.
Other:				
Crude	64,859	69,070	--	Japan 32,779; Italy 9,900; West Germany 8,366.
Slag and dross, not metal-bearing	--	58,253	--	United Kingdom 32,035; Brazil 26,218.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	4,532	2	--	All to Netherlands.
Coal:				
Anthracite and bituminous[2] thousand tons	27,695	30,131	675	Japan 5,604; France 4,248; Italy 3,084.
Briquets of anthracite and bituminous coal	10,651	71,831	--	France 48,267; Sri Lanka 23,564.
Lignite including briquets	72	11,831	--	All to Turkey.
Coke and semicoke	--	15,815	--	Netherlands 10,606; Sweden 3,919; Belgium-Luxembourg 1,000.
Petroleum:				
Crude thousand 42-gallon barrels	--	5,429	--	Greece 3,504; Taiwan 1,023.
Refinery products:				
Gasoline do.	1,632	950	242	Japan 448; Sweden 260.
Mineral jelly and wax do.	109	183	83	West Germany 39; United Kingdom 18; Japan 17.
Distillate fuel oil do.	--	169	--	All to Sri Lanka.
Lubricants do.	9	2	([6])	Mainly to West Germany.
Residual fuel oil do.	8	([6])	--	All to Japan.
Bitumen and other residues do.	55	--		
Bituminous mixtures do.	--	6	--	All to United Kingdom.

NA Not available.

[1]Table prepared by Virginia A. Woodson. Because official South African trade statistics provide data only on the value of total exports of each commodity class (with no data on destinations) and not on quantity of material exported, this table has been compiled from a variety of sources including the data issued by the Republic of South Africa Department of Mines and Department of Mineral and Energy Affairs as well as official trade returns of trading partner countries. Data issued by the Government of the Republic of South Africa are footnoted; other figures are compiled from a variety of sources with specifics on destination obtained from the import statistics of the countries listed. Data presented are exports by the common customs area of Botswana, Lesotho, the Republic of South Africa, and Swaziland.

[2]Data issued by the Government of the Republic of South Africa.

[3]Excludes imports of unreported quantity valued at $3,909,000 by France and $22,000 by Iceland.

[4]May include platinum-group metals.

[5]Incomplete total. Excludes imports expressed in value only.

[6]Less than 1/2 unit.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	26,966	17,196	--	Australia 14,918; Netherlands 55.
Oxides and hydroxides	277,232	357,892	124	Australia 345,679; United Kingdom 4,236.
Metal including alloys:				
Scrap	2,678	6,070	2,747	United Kingdom 1,539; West Germany 1,190.
Unwrought	633	433	--	Switzerland 180; United Kingdom 150; Norway 50.
Semimanufactures	12,620	12,592	783	West Germany 4,654; United Kingdom 1,960; Australia 1,561.
Arsenic:				
Oxides and acids	1	90	--	All from France.
Metal including alloys, all forms	14	9	--	Sweden 7; United Kingdom 2.
Chromium: Oxides and hydroxides	485	774	33	West Germany 341; Spain 135; Belgium-Luxembourg 100.
Cobalt:				
Oxides and hydroxides	9	16	1	Belgium-Luxembourg 3; Australia 2; Canada 2.
Metal including alloys, all forms	77	91	7	Sweden 17; Belgium-Luxembourg 14; Canada 12.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	100	1,300	1,300	
Copper: Metal including alloys:				
Scrap	107	166	NA	United Kingdom 99; unspecified 67.
Unwrought	3,044	978	2	West Germany 255; United Kingdom 87; Belgium-Luxembourg 50.
Semimanufactures	8,398	4,695	227	West Germany 1,784; United Kingdom 633; Japan 475.
Gold: Metal including alloys, unwrought and partly wrought[2] troy ounces	3,196	8,545	NA	France 914; Switzerland 443; unspecified 6,368.
Iron and steel: Metal:				
Scrap	27,462	7,274	NA	Taiwan 17; unspecified 7,257.
Pig iron, cast iron, related materials	9,943	3,782	3	Sweden 1,933; United Kingdom 556; West Germany 121; unspecified 1,048.
Ferroalloys:				
Ferrochromium	7,626	8,088	NA	Sweden 41; unspecified 8,047.
Ferromanganese	91	55	--	West Germany 38; United Kingdom 17.
Ferromolybdenum	--	120	4	West Germany 55; Belgium-Luxembourg 32; United Kingdom 16.
Ferrosilicomanganese	--	7	NA	NA.
Ferrosilicon	1,955	932	--	France 736; West Germany 133.
Silicon metal	46	133	--	France 126.
Unspecified	840	1,069	--	United Kingdom 413; France 308; Brazil 125.
Steel, primary forms	42,787	50,769	NA	West Germany 300; Japan 267; unspecified 49,795.
Semimanufactures:				
Bars, rods, angles, shapes, sections	32,071	48,592	75	West Germany 4,188; United Kingdom 2,474; Japan 1,512.
Universals, plates, sheets	55,900	30,685	268	Japan 19,131; West Germany 7,207; France 1,175.
Hoop and strip	14,716	10,903	106	Japan 3,594; West Germany 1,797; United Kingdom 1,210.
Rails and accessories	1,036	635	1	West Germany 197; Switzerland 111; Netherlands 18.
Wire	22,810	20,432	171	Belgium-Luxembourg 2,825; United Kingdom 1,614; West Germany 1,376.
Tubes, pipes, fittings	60,631	61,895	1,538	Japan 28,790; West Germany 13,426; United Kingdom 4,852.
Castings and forgings, rough	509	735	--	West Germany 149; Taiwan 89; United Kingdom 52.
Unspecified	3,298	2,573	265	West Germany 511; United Kingdom 435; Taiwan 251.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	18	67	--	Mexico 54; West Germany 5.
Metal including alloys:				
Scrap	12,734	216	NA	NA.
Unwrought	3,976	5,438	199	Mexico 1,801; unspecified 3,438.
Semimanufactures	64	90	4	United Kingdom 45; West Germany 17; unspecified 24.
Lithium:				
Ore and concentrate	1,163	1,228	NA	NA.
Oxides and hydroxides	33	102	44	NA.
Magnesium: Metal including alloys:				
Unwrought	408	536	488	Canada 25; Italy 22.
Semimanufactures	97	61	52	Norway 4; Austria 3.
Manganese: Oxides	10,039	4,037	4	Belgium-Luxembourg 3,807; Netherlands 158.
Mercury 76-pound flasks	1,828	1,218	--	Spain 667; United Kingdom 348; West Germany 116.
Molybdenum:				
Oxides and hydroxides	138	10	--	All from West Germany.
Metal including alloys, all forms	11	26	4	United Kingdom 18; Austria 3.
Nickel:				
Matte and speiss	560	455	--	All from Canada.
Metal including alloys:				
Unwrought	103	40	NA	Finland 5; unspecified 35.
Semimanufactures	534	670	20	West Germany 190; United Kingdom 119; France 34.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	61,098	46,669	10,462	United Kingdom 32,462; West Germany 1,169.
Selenium, elemental	13	9	--	United Kingdom 6; Canada 1.
Silver:				
Ore and concentrate[3] value, thousands	$44,308	$67,339	NA	Norway $67,334.
Metal including alloys, unwrought and partly wrought troy ounces	892,601	776,402	--	West Germany 703,587; United Kingdom 54,002; Australia 9,903.
Tin: Metal including alloys:				
Unwrought	41	18	NA	NA.
Semimanufactures	29	30	NA	West Germany 8; United Kingdom 4; unspecified 18.
Titanium:				
Ore and concentrate	54	3	--	All from West Germany.
Oxides	1,032	2,207	405	West Germany 639; United Kingdom 549; Netherlands 285.
Tungsten:				
Ore and concentrate	388	507	54	Canada 162; Sweden 90; West Germany 35.
Metal including alloys, all forms	13	34	11	Sweden 12; United Kingdom 5.
Zinc:				
Oxides	771	180	--	United Kingdom 74; Portugal 36; West Germany 34.
Blue powder	451	730	--	West Germany 416; United Kingdom 260.
Metal including alloys:				
Scrap	520	242	NA	United Kingdom 79; Netherlands 20.
Unwrought	3,851	3,149	NA	NA.
Semimanufactures	106	190	NA	United Kingdom 144; West Germany 37.
Other:				
Ores and concentrates	105	69	64	Chile 5.
Oxides and hydroxides	510	281	71	United Kingdom 61; West Germany 40; Belgium-Luxembourg 36.
Ashes and residues	2,216	1,436	5	West Germany 907; United Kingdom 50.
Base metals including alloys, all forms	321	1,579	29	United Kingdom 93; West Germany 15; unspecified 1,417.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,777	484	133	Italy 65; Japan 17; unspecified 221.
Artificial:				
Corundum	4,290	2,597	761	West Germany 804; United Kingdom 445.
Silicon carbide	2,257	1,766	14	Norway 1,319; Argentina 221; Switzerland 115.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$167	$95	--	Belgium-Luxembourg $60; Japan $20; Belgium-Luxembourg $12.
Grinding and polishing wheels and stones	705	532	51	West Germany 140; Italy 124; United Kingdom 86.
Asbestos, crude	12,878	12,781	13	West Germany 7; unspecified 12,761.
Barite and witherite	1,789	2,384	NA	United Kingdom 504; Australia 162; unspecified 1,521.
Boron materials:				
Crude natural borates	5,498	3,952	315	Netherlands 2,632; United Kingdom 997.
Elemental value	$2,533	$336	NA	NA.
Oxides and acids	920	832	38	France 482; Argentina 197; Italy 70.
Bromine	55	31	1	Israel 16; Japan 9.
Cement	194,239	108,658	NA	West Germany 1,474; France 8,134; unspecified 96,530.
Chalk	7,988	5,753	--	France 3,561; Sweden 1,276; Spain 139.
Clays, crude	r31,249	31,002	18,485	United Kingdom 11,899.
Cryolite and chiolite	115	115	NA	Denmark 73; West Germany 38.
Diamond:				
Gem, not set or strung value, thousands	$80,935	$25,125	$61	Belgium-Luxembourg $1,778; Netherlands $1,649; unspecified $21,621.
Industrial stones do	$3,475	$7,133	$11	Belgium-Luxembourg $2,346; United Kingdom $1,896; Australia $140.
Diatomite and other infusorial earth	7,172	5,849	5,387	West Germany 46; Japan 34.
Feldspar, fluorspar, related materials	33	33	NA	NA.
Fertilizer materials: Manufactured:				
Ammonia	79,524	21,278	21,277	NA.
Nitrogenous	314,097	40,016	10,464	Belgium-Luxembourg 5,373; West Germany 2,006; Ireland 300.
Phosphatic	141	3,249	3,009	Israel 121.
Potassic	144,835	173,541	3	Israel 87,367; Canada 53,657; West Germany 17,391.
Unspecified and mixed	83,883	58,202	57,545	United Kingdom 352.
Graphite, natural	1,630	2,129	211	Norway 603; Brazil 367; Republic of Korea 342.
Gypsum and plaster	7,026	9,523	53	West Germany 6,026; United Kingdom 1,826.
Kyanite and related materials	308	NA		
Lime	9,225	14,361	NA	France 5,648; unspecified 8,713.
Magnesium compounds:				
Magnesite	69,693	32,420	NA	Greece 9,128; Japan 1,215; unspecified 20,999.
Oxides and hydroxides	36,223	26,793	78	Switzerland 8,332; Italy 7,780; Netherlands 3,459.
Mica:				
Crude including splittings and waste	545	486	28	Australia 125; unspecified 333.
Worked including agglomerated splittings	65	80	3	Austria 14; United Kingdom 14; Switzerland 13.
Phosphates, crude	16	2	NA	NA.
Phosphorus, elemental	69	73	--	United Kingdom 59; Canada 14.
Pigments, mineral:				
Natural, crude	372	50	NA	Austria 17; unspecified 33.
Iron oxides and hydroxides, processed	6,857	10,897	12	West Germany 9,639; United Kingdom 1,132.
Potassium salts, crude	64,844	56,813	--	West Germany 18,971; Belgium-Luxembourg 17,516; Israel 11,837.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,071	$1,382	$130	Switzerland $387; Hong Kong $145; Brazil $93.
Synthetic do.	$6,896	$8,384	$254	United Kingdom $7,107; West Germany $97.
Pyrite, unroasted	170	108	20	West Germany 83.
Salt and brine	1,153	43,550	16,243	Australia 24,291.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	254,214	214,041	142,084	United Kingdom 33,474; West Germany 2,694; France 2,061.
Sulfate, natural and manufactured	27,276	40,567	20,199	Spain 6,228; Netherlands 6,112.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,666	2,301	NA	Italy 1,582; West Germany 120; Portugal 120.
Worked	1,411	1,230	--	Italy 1,026; Portugal 67; Taiwan 33.
Dolomite, chiefly refractory-grade	42	102	NA	NA.
Gravel and crushed rock	183	804	67	Australia 112; unspecified 623.
Limestone other than dimension	15	75	NA	NA.
Quartz and quartzite	4,450	92	NA	NA.
Sand other than metal-bearing	376	347	20	West Germany 182; Israel 20.
Sulfur:				
Elemental:				
Crude including native and by-product	590,201	383,414	383,125	West Germany 156.
Colloidal, precipitated, sublimed	136	111	1	West Germany 85; United Kingdom 25.
Dioxide	--	19	NA	NA.
Sulfuric acid	130,574	54,470	--	Belgium-Luxembourg 23,765; West Germany 19,280.
Talc, steatite, soapstone, pyrophyllite	2,503	2,555	238	Republic of Korea 1,140; Italy 339; Belgium-Luxembourg 301.
Other:				
Crude	9,397	7,535	--	Greece 5,377; Australia 1,055.
Slag and dross, not metal-bearing	2,124	3,166	489	United Kingdom 1,437; Taiwan 854.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	302	254	218	United Kingdom 36.
Carbon black and gas carbon	3,416	3,927	2,015	West Germany 711; Canada 473; United Kingdom 426.
Coke and semicoke	6	7	NA	NA.
Peat including briquets and litter	665	651	--	Canada 272; Finland 197; West Germany 105.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	186	974	(4)	Italy 371; France 278; West Germany 116.
Mineral jelly and wax do.	444,143	520,388	47,771	Japan 140,094; West Germany 126,219; Brazil 8,460.
Lubricants do.	13,958	12,572	2,051	West Germany 5,789; United Kingdom 3,171; Belgium-Luxembourg 469.
Bitumen and other residues do.	1,394	721	394	Belgium-Luxembourg 182.
Bituminous mixtures do.	4,326	3,079	571	United Kingdom 788; Netherlands 772; West Germany 490.
Petroleum coke do.	505,318	488,802	438,279	United Kingdom 27,550; Netherlands 22,836.

rRevised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Data presented are imports by the common customs area of Botswana, Lesotho, the Republic of South Africa, and Swaziland released by the Commissioner for Customs and Excise of the Republic of South Africa.

[2]May include platinum-plated gold.

[3]May include platinum-group metals.

[4]Less than 1/2 unit.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1982	1983	1984[p]	1982	1983	1984[p]
METALS						
Antimony	10,978	16,381	16,166	870	1,137	10,008
Chromite	26,209	44,315	43,221	42,466	35,544	43,972
Copper	126,449	122,374	118,765	151,700	194,265	127,695
Gold	(1)	(1)	(1)	8,101,564	9,153,026	8,038,559
Iron ore	122,040	119,788	91,003	216,648	158,860	168,132
Lead concentrate	--	--	--	35,116	22,424	22,050
Manganese	52,471	22,139	22,252	124,442	77,017	119,271
Nickel	9,079	11,061	16,854	36,911	36,848	33,702
Silver	1,226	3,119	561	47,841	60,696	45,462
Tin	14,989	9,435	9,552	20,122	21,778	16,769
Titanium	4,493	5,337	4,377	11,966	9,646	14,289
Uranium[e]	NA	NA	NA	300,000	250,000	200,000
Vanadium	2,061	3,548	3,235	60,446	34,851	58,624
Zinc	23,027	26,588	42,143	12,892	5,171	21,801
Zirconium	445	676	342	18,141	22,551	25,575
NONMETALS						
Asbestos	8,759	5,924	3,680	90,654	92,914	66,519
Cement[e]	300,000	300,000	380,000	35,000	35,000	40,000
Clays, flint	2,968	2,746	2,558	3,550	2,393	1,708
Clays, other	6,415	7,027	3,799	60	26	27
Diamond	(1)	(1)	(1)	315,237	483,328	360,214
Feldspar	3,056	3,116	2,763	144	54	61
Fluorspar	2,762	2,642	2,219	24,431	25,000	32,001
Granite	1,763	1,847	1,452	17,023	21,723	19,071
Gypsum	4,944	5,410	4,669	33	40	23
Kyanite-related materials:						
Andalusite	5,850	5,391	6,239	8,311	7,081	8,519
Sillimanite	570	289	112	1,295	430	178
Lime products	83,512	87,000	77,413	1,974	2,722	2,569
Limestone	56,875	55,336	52,212	178	107	87
Magnesite	2,479	1,765	1,247	--	31	--
Mica	298	319	322	356	406	338
Phosphate rock	63,797	55,581	52,338	5,887	11,196	17,355
Pyrite-sulfur	37,588	42,633	31,512	1,131	569	396
Salt	17,450	19,103	21,896	1,720	3,606	2,491
Silica, sand	14,621	16,670	16,494	283	116	189
Slate	1,959	2,155	1,853	2,097	2,133	2,553
Stone, other	1,532	1,502	1,821	330	277	237
Vermiculite	346	387	374	11,662	9,336	13,315
Wonderstone	254	238	272	467	333	47
Miscellaneous	201,889	253,323	217,586	378,013	557,654	480,807
MINERAL FUELS						
Coal:						
Anthracite	15,559	13,263	30,377	77,602	55,480	100,780
Bituminous	1,289,066	1,300,020	1,161,486	1,034,257	986,572	1,089,769
Total	r2,517,779	2,568,448	2,443,165	r11,192,820	12,382,341	11,185,163

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Value, if any, is included under exports.

Sources: Republic of South Africa Department of Mines. Quarterly Information Circular, Minerals, Oct.-Dec. 1982; Republic of South Africa Department of Mineral and Energy Affairs. South Africa's Mineral Industry 1984.

COMMODITY REVIEW

METALS

Aluminum.—A single smelter with a capacity of about 170,000 tons per year, owned and operated by Alusaf (Pty.) Ltd., was near Richards Bay. Feed material was imported alumina, mainly from Australia; there was no domestic production of bauxite or alumina. Output, near full production capacity in 1984, was about equally divided between exports and domestic use. About 35% of local sales was in the form of molten metal, the remainder was ingot. Local users included Alustang (Pty.) Ltd., an associated company of Alusaf, for production of conductor rod, and the Aluminum Extrusion Co. Ltd. (Almax), for aluminum extrusions and paint.

Antimony.—Reserves of antimony were 254,000 tons of contained metal, second only

to China. Consolidated Murchison Ltd. (CML) was the only producer and was owned 75% by AVL and 25% by JCI. Output from deposits near Gravelotte in northeastern Transvaal graded 2.9% antimony in ore. Local sales of antimony concentrate grading 60% antimony trioxide continued to increase with expanded production of antimony trioxide for flame retardants by Antimony Products (Pty.) Ltd. Most of the trioxide was also exported. A proposal was made by CML for Japanese technical assistance for construction of a smelter. No information on capacity or timeframe for the project was reported.

Chromite.—Gencor purchased the remaining 44% of African Metals Ltd. (AML) from the South African Iron and Steel Industrial Corp. Ltd. (Iscor), and thus gained control of South African Manganese Amcor Ltd. (Samancor), with the latter's manganese and chromite mines. Transvaal Mining and Finance Co. Ltd., a Gencor subsidiary, transferred its three chromite mines, Groothoek, Montrose, and Tweenfontein, with a combined export capacity of 1 million tons per year, to Samancor. The Grasvally, Mooinooi, and Waterkloof Mines were also in operation, but the Ruighoek Mine closed in the rationalization program.

The Grasvally Mine had a chromium-to-iron ratio of 2.5:1 and an average chromium oxide content of 46%, mainly as lumpy ore. Lumpy ore was shipped to Samancor's ferrometals plant at Witbank for production of high-carbon ferrochromium. Fines, with grades of 48% to 54% chromium oxide, were shipped via company-owned rail line to Drummondlea and exported through Richards Bay. Slimes containing 7% chromium were being processed in trial runs, and waste rock was sold for construction purposes.

Cobalt.—Cobalt was a byproduct of PGM production by three companies. Rustenburg Platinum Mines Ltd. (RPM), through its affiliate Rustenburg Refineries (Pty.) Ltd., extracted cobalt sulfate from converter matte and had a capacity of 525 tons per year of contained metal. Impala Platinum Holding (Pty.) Ltd. produced 99.8%-pure cobalt powder at its refinery at Springs, and Western Platinum Ltd. (Wesplat) obtained 99%-pure cobalt cathode from an overseas refiner of its matte. Wesplat was constructing a new base metals refinery near Rustenburg, at a cost of about $12 million, to process its own matte and produce cobalt-nickel sulfate.

Copper.—Output, either as a byproduct or as a primary product, was by nine companies. Palabora Mining Co. Ltd. (PMC), a subsidiary of Rio Tinto Zinc Corp. Ltd. and Newmont Mining Corp., was the largest producer with a total of almost 102 million tons of ore and waste moved in 1984. Over 29.2 million tons of ore grading 0.50% copper was treated and yielded 322,261 tons of 38.4% copper concentrate. The company's smelter produced 117,196 tons of anode copper from PMC's concentrates and 20,648 tons from tolled or purchased material. Total cathode production at PMC's refinery was 136,495 tons consisting of 116,448 tons from PMC sources and 20,047 tons from all other sources. Byproducts included baddeleyite, gold, magnetite, palladium, platinum, silver, uranium, and vermiculite. The cost of production increased 4.4%. Net profit amounted to $39.1 million, the highest since operations commenced in 1966. PMC's labor force was 3,922.

Messina Ltd. continued to experience financial difficulties and sold its mining interests in Zimbabwe to the Zimbabwe Mining Development Corp. Smelter operations ceased in January, and in October, the company was purchased by South African Life and Assurance Co. Ltd. The African Finance Corp. Ltd. and AAC continued to hold 13.6% and 10%, respectively, of Messina. Messina Mine produced 17,976 tons of concentrate containing 7,711 tons of copper, which was sold to PMC where they were smelted. Proven ore reserves were 2.89 million tons grading 1.39% copper. The cost per ton milled was $13.00.

GFSA acquired 41.2% of O'okiep Copper Co. Ltd., which was also 40.2% owned by Newmont. Ore mined and milled was 1.46 million tons grading 1.5% copper. Blister output from O'okiep concentrates was 20,730 tons, and O'okiep also toll smelted concentrates. The Carolusberg, Hoits, and Spiktakel Mines employed 2,000 workers, but Spiktakel was to cease operations in 1985. Carolusberg Mine was to provide 83% of total output.

Gold.—Gold production was up for the fourth consecutive year, and sales were $8.04 billion. A total of 152 million tons of ore and tailings was worked in 1984, a third of which consisted of slimes, sand, and other tailings that were retreated and yielded almost 550,000 troy ounces of gold. East Rand Gold and Uranium Co. Ltd. treated 19 million tons of slimes. About 99% of all gold output was from the Witwatersrand. Over

101 million tons of ore was milled by the main producers at an average grade of 0.207 troy ounce of gold per ton. Total working revenue was $7.6 billion or about $78 per ton of ore milled. Larger tonnages of lower grade ore continued to be mined.

The CM operated the Rand Refinery, gold for which was purchased from the producers at prices based on London gold fixings. The South African Reserve Bank purchased production from the Rand Refinery on behalf of the Government. A portion of these purchases was diverted to the South African Mint for striking both proof and nonproof Kruggerands in 1-ounce, 1/2-ounce, 1/4-ounce, and 1/10-ounce weights. Proof coins were sold by the mint; nonproof coins were handled by the International Gold Corp., the marketing arm of the CM. Over 2.1 million troy ounces in Kruggerands were sold in 1984 out of a total gold production of 21,907 million troy ounces.

The average production cost per ton of gold milled was $40.99, equal to about $199 per troy ounce of gold produced. Mine working revenue averaged $78 per ton of ore milled, equivalent to $363 per troy ounce of gold recovered, leaving an average working profit of $37 per ton of ore milled or $172 per troy ounce of gold recovered. The Kloof Mine of GFSA again had the highest working profit of $129 per ton of ore milled, or $267 per troy ounce of gold produced, and GFSA's Driefontein West and Driefontein East Mines were the next most profitable, respectively.

Table 5.—Republic of South Africa: Gold production and ore reserves, by producer

Producer	Production (troy ounces)				Developed ore	
	1981	1982	1983	1984[p]	Thousand metric tons	Troy ounces per ton
AAC Joint Metallurgical Scheme	112,405	[r]114,492	115,981	129,066	NA	NA
Barberton	38,098	38,160	45,252	56,521	NA	NA
Blyvooruitzicht	604,254	643,372	593,708	501,381	5,187	0.608
Bracken	112,064	106,544	115,103	110,042	1,300	.212
Buffelsfontein	904,506	883,827	966,204	1,011,519	9,800	.308
Consolidated Murchison Ltd	17,580	16,551	18,683	25,302	NA	NA
Deelkraal	171,530	217,574	204,746	234,642	2,991	.212
Doornfontein	382,256	348,440	319,533	314,906	4,100	.311
Driefontein Consolidated Ltd.:						
East Driefontein	1,168,557	1,134,433	1,092,511	1,110,646	15,624	.501
West Driefontein	1,275,333	1,333,809	1,270,662	1,238,930		
Durban Deep	265,173	269,195	251,863	244,734	2,895	.154
East Rand Gold and Uranium Co. Ltd	202,453	187,567	197,341	207,694	NA	NA
East Rand Proprietary Mine	373,984	343,814	357,037	335,017	5,189	.244
Elandsrand	167,322	261,652	316,955	343,813	4,138	.279
Free State Geduld	883,833	816,671	873,803	860,009	8,142	.408
Grootvlei	210,372	229,367	227,505	247,445	5,650	.167
Harmony	1,027,087	1,021,333	1,042,295	1,037,310	24,611	.202
Hartebeestfontein	981,661	959,876	968,663	996,778	20,740	.369
Kinross	310,399	322,141	392,866	432,748	8,600	.305
Kloof	957,034	893,742	978,852	1,048,190	5,323	.675
Leslie	128,429	125,729	125,308	148,170	1,900	.212
Libanon	325,597	343,129	328,423	285,440	7,541	.241
Loraine	211,445	260,749	270,960	278,271	5,995	.260
Marievale	39,124	35,848	39,381	38,790	570	.167
President Brand	859,379	807,418	771,165	726,580	8,304	.366
President Steyn	787,747	801,611	834,292	783,615	13,902	.305
Randfontein	761,297	869,838	952,903	998,781	9,283	.302
St. Helena	500,555	469,828	444,204	396,843	9,850	.340
St. Helena-Beisa	---	20,708	44,918	40,526		
Stilfontein	478,766	401,100	396,354	346,623	4,488	.308
Unisel	235,681	277,782	296,494	291,385	4,800	.266
Vaal Reefs	2,363,314	2,531,865	2,572,281	2,659,969	20,587	.353
Venterspost	181,291	208,353	195,785	203,315	5,682	.221
Western Areas	569,261	544,087	582,732	567,878	5,407	.237
Western Deep Levels	1,254,293	1,269,179	1,268,501	1,158,907	6,239	.572
Western Holdings	1,339,969	1,290,955	1,287,296	1,252,472	14,449	.308
West Rand Consolidated	90,957	122,478	127,960	140,142	6,268	.202
Winkelhaak	447,933	422,313	467,842	471,709	9,900	.282
Witwatersrand Nigel	36,156	30,498	27,653	25,984	NA	NA
Other producers	344,042	378,594	463,684	604,526	NA	NA
Total or average	21,121,137	[r]21,354,622	21,847,699	21,906,619	259,455	.322

[r]Revised. [p]Preliminary. NA Not available.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1980-84; supplements to the Mining Journal (London), 1980-85.

Despite several mine fires at Kloof Mine, mill throughput at 2.075 million tons was only 10,000 tons less than planned. Average ore grades were high, particularly in the Ventersdorp Contact Reef, which sampled 0.565 troy ounce per ton. Average mill grade increased to 0.495 troy ounce per ton, and was expected to rise further. Total ore reserves were 5.3 million tons averaging 0.675 troy ounce per ton.

Driefontein Consolidated Ltd.'s combined milling rate was 475,000 tons per month with a yield of 0.414 troy ounce per ton. Reserves at the East Driefontein Mine were 9.2 million tons grading 0.466 troy ounce per ton. West Driefontein Mine had 6.5 million tons of reserves at 0.549 troy ounce per ton. Shaft development in anticipation of future production continued; about 15 years was required from the start of physical work on a shaft to actual winning of gold.

Gencor, which administered 13 gold mines and accounted for 17% of total South African gold output, indicated the viability of the Poplar gold deposit in the Transvaal. Estimated mill capacity was to be 90,000 tons per month yielding 0.178 troy ounce per ton, and capital costs would be about $350 million.

AAC sought to merge its six mining companies and eight contiguous mining operations in the Orange Free State. The merger would make the complex one of the top gold mining complexes in the world, having milled 20.8 million tons of ore at an average grade of 0.176 troy ounce per ton in 1984. Included was the President Brand Mine where construction of a new plant to treat 390,000 tons of ore per month was under way. Gold recovery would be 96% using AAC's intensive cyanidation process. The merger would allow a higher portion of the nearly 11 million troy ounces of gold in pillars to be recovered, reduce costs, increase profitability, and extend mine life by several years.

Iron Ore and Concentrate.—Iscor produced 18.1 million tons of hematite from the Sishen Mine and 2.3 million tons from the Thabazimbi Mine. Over 10.7 million tons of Iscor's production was shipped from Saldanha Bay for export. Low iron ore exports led to losses at the Sishen Mine estimated at $105 million in 1984, and underutilization of the 861-kilometer Sishen-Saldanha Bay railroad, which can carry 20 million tons of ore per year.

Iron and Steel.—Iscor, which was Government-owned, and its subsidiaries accounted for about 90% of the country's steel production capacity of 8.65 million tons. Highveld Steel and Vanadium Corp. Ltd., the second largest producer, had a production capacity of 0.84 million tons. Iscor continued to modernize its three plants, and reduced the number of blast furnaces from 12 to 7. At its Pretoria Works, it replaced blast furnaces, coke ovens, and open-hearth furnaces with two electric furnaces with continuous casting, maintaining steel capacity at 0.9 million tons per year. A $56 million, two-strand continuous caster was planned for installation at Vanderbijlpark Works. Iron production capacity would increase to 10,000 tons per day from 7,800 tons per day with further upgrading of blast furnaces. Four new rotary kilns were commissioned in June, and sponge iron production commenced in November. The coal-based Lurgi process was used to produce 93% iron in sponge iron for electric-furnace feed. Iscor's raw feed materials were from captive iron, coal, and dolomite mines, supplemented by other producers. Other Iscor subsidiaries included Dunswart Iron and Steel Works, an integrated steel plant with a combined sponge iron and electric-furnace production capacity of 32,000 tons per month, and Cape Iron and Steel Co. (CISCO). CISCO's production for the year ending June 30 was 110,000 tons.

Union Steel Corp. (USC) planned construction of a 300,000-ton-per-year plasma direct-reduction plant at its Vaal Works. A 600,000-ton-per-year pelletizing plant was under construction at USC's Klip Works, and would use magnetite from PMC.

Highveld Steel, owned 50% by AAC, commenced restart of idle capacity and planned to add three additional prereduction kilns and a submerged arc furnace at Witbank. About 30% of production was exported, mainly structural steel and hot-rolled products.

Scaw Metals Ltd., owned 100% by AAC and the largest steel foundry in Africa, in July commissioned a $23 million sponge iron plant with capacity of 75,000 tons per year to supplement scrap utilization. Direct-reduced iron makes up about 40% of electric-furnace feed, and could be increased to 70% in the event of a scrap shortage.

Middelburg Steel & Alloys Holdings (Pty.) Ltd. (MSA), owned 75% by BRL, was the Republic of South Africa's only producer of stainless steel, including the new corrosion resistant 3CR12 variety. Production capac-

ity was 100,000 tons per year as hot-rolled plate, cold-rolled sheet, coil, and strip.

Lead.—There was no smelting of primary lead in the Republic of South Africa. Lead concentrate amounting to 86,000 tons of contained lead was exported for processing. Secondary smelters had a combined capacity of 39,000 tons per year. Consumption was about 50,000 tons per year, 20,000 tons of which was imported.

Shell South Africa (Pty.) Ltd. was to develop an opencast zinc-lead mine near Pering at an initial cost of $43 million. Output would be 90,000 tons per year of lead concentrate grading 65% lead. In 1983, the Republic of South Africa was the second largest exporter of lead in concentrates after Peru.

Manganese.—Production and exports of manganese ore and ferroalloys improved in 1984. Mines that were closed in 1983 were reopened. About 85% of metallurgical-grade ore production was by 11 mines in the Kalahari Field. Total ore shipments by the Associated Manganese Mines of South Africa Ltd. (AMMOSAL) were 1.2 million tons compared with 0.8 million tons in 1983. Ferroalloys Ltd., a subsidiary of AMMOSAL, produced high-carbon ferromanganese and ferrosilicomanganese at its Cato Ridge, Natal, plant.

Delta Manganese (Pty.) Ltd. and Electrolytic Metal Corp. produced manganese metal, and output was consumed mainly in the aluminum industry. Delta Manganese used manganese oxide from the Hotazel Mine in a process that required fine grinding, reduction, sulfuric acid leaching, precipitation, filtering, and electrolytic deposition onto stainless steel cathodes. The final product was shipped as cathode flake and powder, or degassed in a vacuum furnace at 600° C. The Republic of South Africa's manganese metal production capacity was about 40,000 tons per year; ferromanganese production capacity was 710,000 tons per year.

Nickel.—Output of nickel was as a by-product of PGM and copper production. Products produced, 80% of which were exported, included nickel cathode at 99.8% nickel, nickel sulfate, and nickel powder and briquets at 99.8% nickel. Completion of construction of a base metals refinery by Wesplat would lead to further output of nickel sulfate.

Platinum-Group Metals.—Rustenburg Platinum Holdings Ltd. (RPH) (owned 32.6% by JCI, 23.8% by AAC, and 8.3% by Lydenburg Platinum Ltd.) was the holding company of the Rustenburg group of mines. RPH's principal holding was RPM, the largest PGM producer in the Republic of South Africa. Since 1977, RPH has also controlled Atok Platinum Mines (Pty.) Ltd., a small PGM producer. RPM owned a base metals refinery at Rustenburg in the Bushveld Igneous Complex, the latter the source of nearly all PGM in the Republic of South Africa. It also owned the Wadesville precious metals refinery, operated by Matthey Rustenburg Refiners (Pty.) Ltd. (MRR), which owned and operated the Royston precious metals refinery. Johnson Matthey PLC was the sole marketing agent for MRR, although some output was purchased directly under long-term contracts.

RPM's major production was from the Merensky Reef, which has a PGM content of 0.17 troy ounce per ton, but the company has also experimented with the UG2 chromitite seam, which grades 0.191 troy ounce per ton. Flotation and gravity concentration were employed to produce a concentrate that was pelletized and smelted in an electric furnace to produce a matte. The matte assayed about 50% nickel, 28% copper, 1% to 2% iron, 21% sulfur, and 48 to 64 troy ounces of PGM per ton. The matte is cooled at a controlled rate to produce a magnetic PGM-rich phase, which is treated for separation of individual metals.

Wesplat, (owned 50.4% by Lonrho Ltd., 25% by Falconbridge Ltd., and 24% by Superior Oil Co.) milled 2 million tons of ore averaging 0.156 troy ounce of PGM per ton, both increases over those of 1983. Of this amount, 1.39 million tons grading 0.153 troy ounce per ton was from the Merensky Reef and 609,000 tons grading 0.194 troy ounce per ton was from the UG2 chromitite seam. Matte output was 4,074 tons and contained 203,182 troy ounces of PGM. Byproduct output included 1,962 tons of nickel, 1,198 tons of copper, and 22 tons of cobalt. Sales included 4,208 troy ounces of rhodium, 11,981 troy ounces of ruthenium, and 1,540 troy ounces of iridium. Wesplat was increasing output from the UG2 seam by 240,000 tons over a 2-year period, primarily because of its higher rhodium content. A base metals refinery was under construction as well as a precious metals plant to improve recovery of iridium, rhodium, and ruthenium. Matte has been sent to Falconbridge's plant in Norway for cobalt, copper, and nickel recovery. Precious metals values were returned to Wesplat for recovery at the Brak-

pan precious metals refinery. Process time for the matte would then be reduced from over 3 months to less than 1 week. Chromite from the UG2 seam, grading 30% to 32% chromium oxide, was stockpiled at the rate of 55,000 to 60,000 tons per month.

GFSA was drilling in the UG2 seam and expected to commence output within 2 years at about 300,000 troy ounces of PGM per year.

Silicon.—Silicon metal was produced by Silicon Smelters Ltd., a subsidiary of Samancor, at Pietersburg using high-purity quartz from the Witkop deposit. Three submerged arc furnaces totaling 98 megawatt-amps had a capacity of 42,000 tons of metal per year.

Tin.—Rooiberg Tin Ltd., a subsidiary of GFSA, produced 2,380 tons of gravity concentrates grading 58.7% tin from new ore and 2,200 tons of flotation concentrates grading 17.4% tin from reclaimed material. A small tonnage was also obtained from retreated slag. Total ore mined was 698,000 tons grading 0.42% tin, compared with 0.49% in 1983. Overall recovery fell to 75.7% from 77.8%, mainly owing to declining ore grade. Tin contained in concentrates and metal sold was 1,738 tons. Smelter throughput was 2,363 tons of concentrate grading 59% tin, producing 1,346 tons of metal with a recovery of 97%. Low-grade concentrates were no longer smelted. The recovery rate of tin from the slag retreatment circuit was 48%.

Union Tin Mines Ltd., also a subsidiary of GFSA, mined 170,000 tons of ore grading about 0.47% tin, down slightly from that of 1983. Overall recovery was 61.6%, and continued to decline. Reclamation of old sand dump material, grading 0.61% tin, was discontinued owing to low recovery. Although ongoing exploration revealed several small extensions to existing lodes, a large number of support pillars were being withdrawn, and underground operations were expected to decline and possibly cease in 2 years.

Zaaiplaats Tin Mining Co. Ltd. milled 106,000 tons of ore with an overall recovery grade of 0.187% tin, compared with 94,000 tons and 0.185% tin in 1983. Smelter output was 198 tons compared with 173 tons in 1983. A new mill was operational with throughput of 7,000 tons per month. Accumulated smelter slag was sold to the United Kingdom. Currently, produced slags were uneconomic owing to their low grade. A new ore handling system was being instituted, and the company may switch to oil firing of its furnaces from gas firing.

Iscor smelted tin at the Vanderbijlpark Complex from concentrates imported from Namibia. A single 350-kilovolt-amp submerged arc furnace produced 862 tons from 1,389 tons of concentrate grading 62.5% tin.

Titanium.—Titanium production was by Richards Bay Minerals (RBM), which consisted of Tisand (Pty.) Ltd., responsible for mining operations, and Richards Bay Iron and Titanium (Pty.) Ltd., responsible for processing and smelting. Output of concentrates of ilmenite and rutile by RBM was over 1.2 million tons compared with 1.0 million tons in 1983. Mining was by floating dredges in artificial ponds, which supplied a floating concentrator for heavy metal separation. Standard gravity, magnetic, and electrostatic techniques were employed for individual mineral separation. The ilmenite was smelted to produce pig iron and a titanium slag grading 85% titanium dioxide, which can be used as a substitute from rutile. S.A. Tioxide (Pty.) Ltd. marketed 10 grades of pigment produced from the slag. RBM continued to implement expansion plans for concentrates and slag production.

Vanadium.—The Republic of South Africa was the world's leading producer of vanadium. Highveld Steel, owned 50.1% by AAC, operated the Mapochs Mine at Roossenekal in eastern Transvaal, exploiting vanadiferous, titaniferous magnetite grading 1.6% vanadium pentoxide (V_2O_5). Prereduced ore was smelted in electric furnaces at Witbank, yielding a vanadium-rich slag from oxygen blowing of the molten metal. The company's Vantra division produced V_2O_5 from salt roasting and leaching of ore fines, as did Transvaal Alloys Co. Ltd.

Vametco Minerals Co., formerly Ucar Minerals Corp. Ltd., produced V_2O_5 at Brits. Local sales of V_2O_5 were for production of ferrovanadium.

Zirconium.—Zirconium was produced by RBM as zircon and by PMC as baddeleyite, the latter making up about 14% of total concentrate output. Premium-grade zircon, grading 66% zirconium dioxide (ZrO_2), was used in ceramics and standard zircon, 65% ZrO_2, was used in refractory brick and foundry sand. Both were produced by RBM.

Baddeleyite was produced independently by PMC and the Phosphate Development Corp. Ltd. (Foskor) from PMC's open pit at Phalaborwa. PMC commissioned two new plants to produce baddeleyite. PMC pro-

duced 9,158 tons of zirconium chemicals, compared with 5,531 tons in 1983. N-grade and special-grade baddeleyite concentrates were produced by gravity concentration and chemical treatment, respectively. Foskor produced four grades of baddeleyite concentrate, all exceeding 96% combined zirconium and hafnium oxide. The main contaminants in the four grades were generally oxides of titanium, iron, and silicon.

NONMETALS

Andalusite and Related Minerals.—The Republic of South Africa led the world in production of andalusite. Reserves were primarily in shales of the Pretoria Group, metamorphosed rock adjacent to the Bushveld Igneous Complex. Six mines were in production in 1984, and concentrates produced ranged from 52% to 60% alumina. About 64% was exported. Sillimanite production, which had declined from 1980 to 1983, increased in 1984 and was produced at the Niemoller and Pella Mines in northwestern Cape Province.

Asbestos.—Three varieties of asbestos—amosite, chrysotile, and crocidolite—were produced at 10 mines employing over 10,000 people. The Penge Mine in northern Transvaal was the only amosite producer. Amosite was used in saltwater applications owing to its chemical resistance.

Msauli Asbestos Ltd. owned the Msauli Mine, which was operated by African Chrysotile Asbestos Ltd., and accounted for about 90% of total chrysotile output. Management was by Griqualand Exploration and Finance Co. Ltd. (Gefco), a subsidiary of Gencor. Gencor held 39.4% of Msauli Asbestos Ltd. Mine flooding owing to a typhoon in February caused nearly a 15% drop in output. About 850,000 tons of ore was mined in 1984 using sublevel caving methods. Ore was shipped 2 kilometers by ropeway to a mill where three grades of fiber were produced.

Abandoned mines and areas in eastern Transvaal, which were worked since about 1900 for asbestos production, were under study for possible cleanup owing to their health-related hazards.

Cement.—Blue Circle Cement Co. Ltd. completed a new bulk handling system at its Lichtenburg plant, valued at about $17 million. Bulk loading capacity was 1,800 tons per hour. Two silos with a capacity of 17,500 tons each were also constructed.

Pretoria Portland Cement Ltd. (PPC) continued construction of a $210 million cement works at Dwaalboom, due for completion in 1986. A 24-kilometer-long railroad from Middelwit was included in the project.

A $172 million clinker plant was completed near Port Shepstone, about 100 kilometers south of Durban, by a consortium of cement producers. Capacity was 500,000 tons per year, using Natal limestone. A $21 million railroad was built to the coast for raw materials and shipment of clinker on to Durban for processing to cement. Cement for the area was formerly shipped for Lichtenburg.

O'okiep was to construct a cement plant near its Carolusburg Mine. Slag from the company's copper smelter was to be used as feed material; the cement produced would be used for backfill operations and was expected to save $1.6 million per year.

Diamond.—De Beers Consolidated Mines Ltd.'s diamond mines accounted for about 94% of the Republic of South Africa's total diamond output. There were 51 operating mines employing nearly 18,600 people. Three operations produced diamonds exclusively from tailings, and another 12 mines processed both ore and tailings.

A 6-meter-diameter ventilation shaft was being excavated by raise-boring at the Premier Mine. Allocation of 54 concession areas off the west coast was completed in 1984. Ocean Diamond Mines (ODM) commenced exploration offshore in the Orange River Delta area. A ship-based dredging operation with a heavy-medium-separation plant was to be the method of exploitation. ODM expected the operation to produce 2,000 to 3,000 carats per month.

The Golden Dumps Pty. Ltd. continued to make acquisitions, buying up the Star Mine, a kimberlite deposit in the Orange Free State near Theunisen. Underground mining was to resume following deepening of the vertical shaft. The company also purchased the Dawn Diamond Co., which held a sea concession off the west coast.

Table 6.—Republic of South Africa: Marketed diamond output, by Province

Province	1982		1983		1984[p]	
	Output (carats)	Price per carat	Output (carats)	Price per carat	Output (carats)	Price per carat
Mine diamond:						
Transvaal	2,251,169	$18.54	2,673,249	$22.37	2,538,954	$23.62
Cape Province	4,756,484	21.98	6,184,238	27.54	5,715,141	23.56
Orange Free State	219,098	92.37	99,188	74.21	113,678	38.87
Total or average	7,226,751	23.04	8,956,675	26.51	[1]8,367,774	23.79
Alluvial diamond:						
Transvaal	26,690	187.62	36,353	200.79	42,224	162.01
Cape Province	1,225,356	117.25	1,316,729	156.55	1,208,433	93.74
Orange Free State	321	372.37	602	48.66	344	494.10
Total or average	1,252,367	118.75	1,353,684	157.69	1,251,001	96.16
Grand total or average	8,479,118	37.18	10,310,359	43.74	9,618,775	37.44

[p]Preliminary.
[1]Data do not add to total shown because of independent rounding.

Sources: Republic of South Africa Department of Mineral and Energy Affairs, Quarterly Information Circular, Minerals, Oct.-Dec. 1981-82, p. 6, and Monthly Commodity Summaries for 1983 and 1984. R1 = US$0.9228 for 1982, R1 = US$0.8991 for 1983, and R1 = US$0.6954 for 1984.

Emerald.—Golden Dumps took over Gravelotte Emerald Mines Ltd., which was the only emerald producer in the Republic of South Africa with two mines, the Cobra and the Discovery. Output was about 50 kilograms per month from two ore bodies in schist host rock. The opencast mining operation had a waste-to-ore stripping ratio of 7:1, with an average yield of 38 carats per ton. Processing was by a series of crushers and hand sorting. Less than 10% of production was considered gem quality, and rough emerald output was exported mainly to Canada, Switzerland, the United Kingdom, and India. Sales were about $3,000 per kilogram, and the company may seek to cut emeralds prior to export for increased return.

Fluorspar.—Four mines were operational in 1984. Acid-grade fluorspar was the most important grade on both a tonnage and value basis, and production capacity was in excess for several years owing to depressed export markets. Output was mainly from the Bushveld Igneous Complex, where Gencor's Buffalo Mine operated with a capacity of 240,000 tons per year.

Gypsum.—There were 13 gypsum operations in 1984 with a production of over 535,000 tons. Gypsum beds were found mainly in the Ecca Group, Karoo sequence, and were formed mainly in a terrestrial environment from the interaction of sulfuric acid and calcareous material. Open pit mines used conveyors or trucks for transport to washing plants where concentrates grading about 85% gypsum were produced, compared with run-of-mine material grading 20% to 35% gypsum. Synthetic gypsum was also produced from the manufacture of phosphoric acid; over 82,000 tons was consumed in the agricultural sector in 1983.

Gypsum Industries Ltd. was the largest producer of gypsum. The company commenced development of a high grade gypsum deposit near Granaatsboskolk in northwestern Cape Province in October at a development cost of about $1.4 million. Run-of-mine ore was 84% gypsum and would not require beneficiating. Truck transport would connect with the underutilized Sishen-Saldanha Bay railroad line about 36 kilometers south of Granaatsboskolk for shipments to Pretoria. Output would replace declining production from the Kimberley deposit, and would commence at 50,000 tons per year with full capacity planned at 250,000 tons per year.

Phosphate Rock.—The Phalaborwa Igneous Complex was the main source of phosphate contained in foskorite, a serpentine, magnetite, apatite rock. Reserves in foskorite were 20 million tons for every 30 meters of depth at a cutoff grade of 6% phosphorus pentoxide (P_2O_5) and an average grade of 8.6% P_2O_5. Additional reserves existed in the adjacent pyroxenite zone, and total reserves to a depth of 600 meters and at a cutoff grade of 5% P_2O_5 were 2.3 billion tons. Foskor accounted for over 99% of total output, both from primary foskorite and pyroxenite ore and from phosphate tailings

from PMC's copper mine. Concentrate graded up to 39.5% P_2O_5. A dry extraction process employing high intensity magnetic separators was successfully tested. Modifications of the process were under way for further improvement in concentrate grade. Foskor exported over 219,000 tons of phosphoric acid and 500,000 tons of phosphate rock in 1984, as well as granulated fertilizer mixtures.

Output by two small producers near Saldanha Bay, Langeboam Phosphate Works and Saldanha Bay Aluminum Co. Pty. Ltd., was from sedimentary-type deposits grading 6% to 15% P_2O_5. Reserves of phosphate nodules between Lamberts Bay and Port Elizabeth on the Continental Shelf were estimated at 8 billion tons grading 10% to 20% P_2O_5.

There were five producers of mixed fertilizer products with a total capacity of 5.2 million tons and about 60% capacity utilization. Domestic consumption was about 3.6 million tons per year.

Soda Ash.—About 250,000 tons of soda ash was imported in 1984, and soda ash was considered a strategic material. A venture for production of synthetic soda ash by AVL, African Explosives and Chemicals Industries, and the Industrial Development Corp. of South Africa Ltd. was postponed pending possible startup of a 300,000-ton-per-year year natural soda ash plant near Sua Pan in Botswana by British Petroleum of South Africa Ltd.

Vermiculite.—Output was by the Vermiculite Operations Department of PMC from the northern portion of the pyroxenite unit of the Phalaborwa Igneous Complex. Total reserves were 73 million tons. Ore beneficiation included crushing, drying, screening, cleaning, and grading. Unexfoliated vermiculite was shipped to a processing plant where exfoliation would take place in vertical furnaces at 1,100° C. About 9% of output was used locally, the rest was exported, accounting for about 90% of total world trade in vermiculite.

MINERAL FUELS

Coal.—Production and exports of coal again increased. Future domestic demand was to be from new thermal powerplants, which in 1984 accounted for about 50% of local sales totaling 122 million tons. Local sales to other sectors included industry and synthetic fuels, 36%; metallurgy, 7%; merchants and home use, 5%; and transport and mining, 1% each. Increased use of diesel and diesel-electric locomotives led to further declines in coal consumption by the transport sector. Of total coal production, 30% was from open pit mines and 70% from underground mines. The Transvaal and Natal were the two main coal producing regions. Working cost of production of marketable steam coal from the Transvaal was about $7 to $10.40 per ton, and for Natal, $11 to $17.40 per ton. Beneficiating processes to improve the generally high ash coal resulted in coal discards of 35 million tons.

Of 38 million tons of coal exported, 86% was steam coal, and the remainder was blend coal for coking. The Government prohibited the export of pure coking coal owing to limited resources. Exports through Richards Bay were 35.2 million tons; Durban, 1.9 million tons; and Maputo, Mozambique, 331,000 tons. About 635,000 tons was shipped to other countries in Africa. Europe was the destination for 60% of all exports, led by France, the Federal Republic of Germany, and Italy. Most of the remainder went to Asia, led by Japan, 7 million tons, and Taiwan, 2.5 million tons. The average free-on-board cost at Richards Bay ranged from $16.27 per ton for Transvaal coal to $27.91 per ton for anthracite from Natal. Included were port handling charges of $2.61 per ton and rail costs of $2.01 to $6.40 per ton. Local coal sales prices were fixed by the Government, but exports were based on free market prices. Both current and future export quotas were allocated by the Government.

AAC was the largest producer, with 12 collieries. The Goedehoop underground mine was commissioned in February and will have a production capacity of 4 million tons for export. The New Denmark Colliery began deliveries to the 3,600-megawatt Tutuka powerplant, which was to be formally commissioned in 1985. The New Vaal Colliery, with a capacity of 6 million tons per year, was to supply the Lethabo powerplant.

Gencor produced about 27 million tons of coal in 1984. Nearly $600 million has been targeted to raise coal sales by about 7.5 million tons. Another $117 million was budgeted for a project to extract oil from Torbanite shale. Output from the Kwa Ngoma anthracite mine was to commence by yearend 1985 with 1.5 million tons of coal for export. Capital cost of the mine was about $60 million.

The South African Coal, Oil and Gas Corp. Ltd. (Sasol) accounted for 20% of total coal output, mainly by its Sigma and Secunda Collieries for its oil-from-coal industry.

The Bosjesspruit Mine, one of four mines in the Secunda Group, was to have a delivery capacity of 27 million tons per year. Sasol's group turnover was $1,541 billion; profit before taxes, $300 million; and net profit, $287 million.

Government assistance to the coal industry included that by the Electricity Supply Commission (Escom) and SATS. Escom provided lower cost loans to new mines that met coal reserve requirements. SATS was to spend $830 million over 3 years to upgrade railroad transport from Witbank to Richards Bay, with unit trains of 200 cars to be used.

Petroleum.—Sasol reportedly saved the equivalent of $1.4 billion in foreign exchange through its oil-from-coal technology in lieu of importing crude or refined products.

The Southern Oil Exploration Corp. (Pty.) Ltd. (Soekor) reported a flow of 2,600 barrels per day of crude oil from a test well in the Mossel Bay area about 50 miles from shore in 100 feet of water. Soekor has drilled 11 potentially economic wells with gas reserves estimated at about 450 billion cubic feet. An estimated $300 million has been spent in oil and gas exploration since 1965. Development of the Mossel Bay gas resources was under consideration, with both Government and private company participation.

Uranium.—Gencor's Beisa Mine, a primary uranium producer, closed owing to the poor market for uranium. About 5,000 workers were adversely affected. Uranium recovery from the Western Deep Levels gold mines also ceased in late 1984. Several uranium recovery plants elsewhere also ceased production, including the Merriespruit plant of Harmony Gold Mining Co.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R1 = US$0.8991 for 1983 and R1 = US$0.6954 for 1984.

Table 7.—Republic of South Africa: Production of U_3O_8, by producer

(Kilograms)

Producer	1980	1981	1982	1983	1984[p]
AAC Joint Metallurgical Scheme[1]	977,116	1,093,416	863,361	718,928	596,787
Blyvooruitzicht	324,482	315,502	252,270	289,156	233,092
Buffelsfontein	603,800	631,750	580,500	611,000	613,500
East Rand Gold and Uranium Co. Ltd.	295,314	302,194	264,814	229,885	164,000
Harmony	490,822	580,428	591,090	623,600	496,680
Hartebeestfontein	435,242	478,663	429,103	441,446	436,283
Palabora Copper	140,000	234,206	257,879	218,635	159,769
Randfontein	646,452	591,774	462,837	491,067	592,776
St. Helena-Beisa			253,612	454,792	353,294
Vaal Reefs	1,758,386	1,693,569	1,721,782	1,877,421	1,962,977
West Driefontein	251,656	242,327	224,601	174,566	159,638
West Rand Consolidated	385,924	190,258			
Western Areas			170,638	282,465	305,403
Western Deep Levels	212,562	212,484	183,394	173,841	145,632
Miscellaneous	773,619	668,320	577,176	541,190	542,395
Total	7,295,375	7,234,891	6,833,057	7,127,992	6,762,226

[p]Preliminary.
[1]Includes recovery of U_3O_8 from concentrates and tailings produced by the Free State Geduld, Free State Saaiplaas, President Brand, President Steyn, Welkom, and Western Holdings mines, all subsidiaries of Anglo American Corp. Ltd. in the Orange Free State Province.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1980-84; Republic of South Africa, Department of Mineral and Energy Affairs. Quarterly Statistical and Other Data on Minerals, Oct.-Dec. 1979-82; Republic of South Africa, Department of Mineral and Energy Affairs. Annual Reports 1980-83; Palabora Mining Co. Ltd. Annual Reports 1980-84; and East Rand Gold and Uranium Co. Ltd. Annual and Quarterly Reports, 1979-83.

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